This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

**About Google Book Search**

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

TRANSPORTATION
LIBRARY
TE
155
.M12

A 757,452 DUPL

PROPERTY OF
University of Michigan Libraries
1817
ARTES SCIENTIA VERITAS

SPEEDY
BINDER
Manufactured by
GAYLORD BROS. Inc.
Syracuse, N.Y.
Stockton, Calif.

Mc Adam, John Loudon

Transportation
Library
TE
155
.M12

# LETTER

TO

## SIR ALEXANDER MUIR M'KENZIE, BART.

ON

## THE SUBJECT

OF

# SCOTTISH ROADS.

HERTFORD:
S. STAUGHTON, PRINTER, COUNTY-PRESS OFFICE.
1833.

UNIVERSITY OF MICHIGAN LIBRARIES

Transportation
Library

Transport Lib.
F. Edwards
6.9.55
72965

Transportation
Library
TE
155
.M12

# LETTER

ON

# SCOTTISH ROADS.

ON

# SCOTTISH ROADS.

*Hoddesdon, Herts,* 16*th December,* 1832.

Dear Sir,

I am encouraged by the meritorious part you have acted, in the affairs of the roads of the country, and particularly those of the County of Perth, to submit to you some papers, first published in America, on the subject of roads—together with a Letter I was induced to write to a gentleman of that country, in consequence of those publications.

My reasons for wishing to communicate those papers to you, and to your friends, is, that they appear to me to prove that the subject has excited attention in other countries, and that my system has been considered simple and effectual, by a people who have not been biassed by former erroneous practice, and who have not become attached to old and inefficient servants. The people of America are famed for economy, and for generally adopting the most direct means for compassing their ends.

The heavy debt upon the roads in Scotland, has created the necessity for a rate of Tolls very oppressive on Commerce and Agriculture; the original erroneous construction of the roads, was not only attended with a lamentable waste of money, but has entailed upon the country a heavier expense for repair than would have been necessary, had the roads been originally constructed on better principles.

The interest of this heavy debt, and the continual expense of repairing the roads, originally ill-constructed, has naturally led the Gentlemen of Scotland, to consider of some means of diminishing the Road Debt, and thereby relieving the country from some part of the heavy rate of Tolls: this very laudable purpose will be accomplished only by such a system of order, economy, and science, as will produce the best construction of roads; by which they may, in future, be maintained in good condition, at a moderate rate; the saving of revenue will then enable Trustees to pay off, gradually, a part of the debt, which may be followed by a reduction of Toll Rates, at the same time giving to the public the advantage of smooth, solid, substantial roads, not liable to be affected by changes of weather.

The heavy debt on Scotland, occasioned by the original making of the roads, has been diminished only in some parts of the country; over the Kingdom generally, I have reason to believe that it is rather on the increase, owing to the large expense of repair; in some counties, it has increased very much during the last ten years; and it will probably go on increasing, unless measures be adopted for introducing a more economical system of repair.

The Road Debt of Scotland reported to Parliament in 1821, amounted to 1,329,946*l.*, but there were no returns from nine of the Counties,—Argyle, Inverness, Ross, Caithness, Sutherland, Fife, Kinross, Cromarty, and Bute; and, at that time, there was a considerable sum of unascertained floating debt.

There are no accounts published since 1821 from Scotland, as that part of the Kingdom was not required, by the Act of 3rd George IV., to make annual returns to Parliament; but it would not be difficult to procure information from the several counties of the present state of the debt; and, should it be found that the debt is on the increase, it becomes matter of serious consideration to all Scotland, that measures should be taken, at least, to arrest its further progress.

As the present oppressive weight of Tolls precludes the possibility of an increase, the only mode that appears practicable by which the roads can be brought into a good state, and in future maintained at a reasonable expense, is by a better system of management, by introducing more order, more effectual control and direction over the work and the expenditure: by such a system the interest of the public in the good state of the roads, and the security of the creditors, will be equally consulted; and, in the course of a few years, the country may be materially relieved by a reduction of the rate of Tolls.

I am supported in the opinion I take the liberty of laying before you on this occasion, by the experience of the last seven years in Scotland, principally in your county; and I may safely appeal to what has been done there, as a proof of what may be done generally in all Scotland by the same process.

I have the honour to be, with respectful esteem,

DEAR SIR,

Your most obedient, humble servant,

JOHN LOUDON McADAM.

*Sir Alexander Muir M'Kenzie, Bart., of Delvine,*
*Vice-Lieutenant of the County of Perth.*

# EXTRACTS

*From the Numbers* 13 *and* 34, *of the "Rail Road Journal," of New York, of the* 24*th of March, and the* 18*th of August*, 1832.

McAdam Roads.—We are anxious that it should be understood among all the friends of internal improvement, however carried on, by Federal, State, or individual enterprise, that in adopting for our title that of a Rail-road Journal, we by no means intend or desire to exclude papers upon all other analagous modes of conveying passengers and produce. We believe that Rail-roads are destined to effect as great a change in travelling and in the transportation of light goods at least, as the original application of the power of steam to boats, has done; but we are sure that such roads may not always be practicable, and fear that too many attempts, made under discouraging circumstances, to construct them, may tend to impair confidence even in well-digested plans. Rail-roads, however, are not our present theme; but, as we have said at the head of this article, McAdam Roads. A letter addressed by Mr. C. H. Hammond, of the Bennington Iron Works, Vt., to Mr. Tibbetts, of Troy, which will be found in this number of the Journal, will, we think, give to its readers a more practical notion of the value as well as of the principle of roads constructed according to Mr. McAdam's plan, than any publication we have before seen. We recommend it to the attention of all road-masters, proprietors of turnpike stock, and others interested in making roads and keeping them in repair. It seems that, even as a matter of economy in the first cost,—to say nothing of the subsequent expenses of repair which on common roads are so enormous,—the McAdam plan is greatly cheaper than that, universally practised upon among us, of bedding the road with stones and covering those with earth and gravel. If this proposition be established, it will then be incredible—so simple, certain, and perfect seems to us the result of McAdam's plan—that our road-makers should persevere in the old way, and insist upon making indifferent roads at an increased cost. Mr. Hammond, we observe, in the close of his letter, expresses a wish that a volume in his possession, containing important information respecting the McAdam system, could be republished. We cheerfully offer him our columns; and if he will transmit the book in question to us, we will, from time to time, furnish connected extracts from it, until the whole, or at any rate the most material parts, be spread before our readers.

*Copy of a letter from C. H. Hammond, Esq., to the Hon. Geo. Tibbetts, dated Bennington (Vt.) Iron Works, 29th February,* 1832.

Dear Sir,

At your suggestion, I sent to England for such information as could be procured, on the subject of Mr. McAdam's system of road making, and road repairing. From the materials received, I propose to give you a few extracts, accompanied with such observations as may be necessary to explain Mr. McAdam's theory, in the hope that you and some others may do something towards correcting the errors which we are committing in making our new roads. Whether opinions, which seem somewhat rooted, can be eradicated just yet, is in my mind doubtful; but most certainly, when McAdam's theory is once understood, no apology can be offered, for making him god-father to a system, which, if not precisely, is in principle, the one he has been for more than thirty years endeavouring to demolish. "It is of the utmost importance," says Mr. McAdam, "that the theory be perfectly understood, as from a want of comprehending the original nature of the system, have arisen the many fruitless attempts at imitation, which have cost such vast sums to the public. Those who continue to use any part of the old method of road-making, are not, perhaps, aware of the principles upon which they are acting." That method thus utterly condemned, which is "common in England, and almost universal in Scotland," is thus described by Mr. M. McAdam: The first step is "to dig a trench, in this trench to deposit a quantity of stones, after this, a second quantity broken smaller; these beds of stone are called the bottoming of the road, and are of various thickness, according to the caprice of the maker, and generally in proportion to the sum of money placed at his disposal. On some roads in Scotland the thickness exceeds three feet. That which is properly called the road, is then placed on the bottoming, by putting large quantities of broken stone, or gravel, generally a foot or eighteen inches thick, at once. Any improvements," he says, "that have been made on this plan merely relate to the smoothness of the surface, by more carefully laying the stones, and consequently, at a greater expense; but the original principle remains the same on every road, except where the new system has been fully adopted. From the conviction of the very insufficient and expensive nature of this method, I was led," says Mr. Mc A., "to consider the possibility of constructing lines of communication, capable of carrying the heaviest weights over any *kind of soil, at all seasons*, upon principles purely scientific." Before attempting to describe Mr. Mc A.'s plan, or to explain his theory, I have thought it well to give, in his own words, a description of the system which he condemns, which is in principle the one adopted in the State of New York, and from which, to use his own felicitous comparison, his system "differs, even in theory, as widely as the principle by which an arch is thrown over a river, differs from the heap of stones which constitutes the ford." I know nothing practically of Mr. McAdam's system, but what I saw casually, in England, ten years ago, when I was much struck with the perfection of his roads. In examining the subject now, I have been delighted with his cheap and simple mode of operating, and very favourably impressed with the soundness of the principles upon which his theory is founded. The strongest possible evidence of its practical utility, is the success of his system in England and Scotland, perhaps the most trying climates in the world for roads, in consequence of the frequent rains and fogs, and the severe frosts and snow, succeeded by sudden thaws. There is a received impression that our own climate is less favorable to good roads, on account of the intensity of the cold, and the depth to which the frost penetrates into the ground. But if this be correct, it only tends to weaken the argument in favor of a system which has been found both in England and Scotland insufficient and pernicious, for the roads there constructed upon the principle which we are now adopting here, "break up in a very alarming manner, and to an extent that creates great loss and inconvenience."

In January, 1820, all the roads about London, constructed on the old system of "bottoming," broke up so, that the mails were obliged to reach the metropolis by circuitous routes, while not one of the new roads gave way, nor were they affected by the rigor of that winter; yet none of these new roads were ever six inches thick." "It is worthy of observation, that the bad roads cost more money per mile, for their annual repair, than the original making of the new roads." In attempting to guard against deep freezing, or to go "below the frost," as it is called, the primary cause of injury from the frost does not appear to me to have been properly considered. Whether frost penetrate six inches, or four-and-twenty, the effect of a thaw must be to break up the surface and let in the water; and water admitted into a mass of unconsolidated stones, deposited in a receptacle where it is likely to be accumulated, must occasion greater mischief, if arrested by frost, than it would in the natural ground. In either case, a breaking-up must follow, and in the case of the stones, the damage to the road would be irremediable, except by an entire reconstruction. But frost is only an incidental cause of mischief, altogether contingent upon the presence of *water;* neither duration nor intensity of cold, nor sudden thaws can produce any sensible effect upon a road without it. Clay roads kept perfectly dry—I do not refer to atmospheric moisture, nor to the natural moisture of the ground, but to *under* water, and to rain—would be as good in thaws, and wet weather, as every one knows them to be, in the dry season of summer. It is the expansion of the water by congelation that loosens and displaces the materials of a road, or the native soil.

Such are my views of the philosophy of Mr. McAdam's theory; at any rate, to guard against *water* is the aim and end of his method.—"There cannot be a doubt," says Mr. McAdam, "that all roads may be made smooth and solid in an equal degree, and to continue so at all seasons of the year. Their durability will of course depend upon the strength of the materials of which they may be composed, but they will be all good while they last; and the only question that can arise respecting the kind of materials, is one of time and expense, but never of the immediate condition of the roads. The roads can never be rendered thus perfectly secure until the following principles be fully understood, admitted, and acted upon, namely: That it is the *native soil* which really supports the weight of the traffic; that while it is preserved in a *dry state* it will carry any weight, without sinking, and that it does in fact carry the road and the carriage also; that the native soil must previously be *made perfectly dry*, and a covering perfectly impenetrable to rain, must then be made to *preserve* it in a dry state; that the thickness of a road should only be regulated by the quantity of material necessary to form such impervious covering, and never by any reference to its own power to carry weight." These are Mr. McAdam's principles, in his own language. So entirely does he condemn the old practice of a stone foundation, that he considers it not only "a useless expense, but a mischievous preparation." He holds that the native soil is the best foundation, whether clay, sand, morass, or bog, "if it was not such a bog as would not allow a man to walk over it." In his examination before a select committee of the House of Commons, he says "I should prefer a bog." "If a road, (that is the covering) be made smooth and solid, it will be one mass, and the effect of the substrata can never be felt in effect, by carriages going over the road, because a road well made, unites itself in a body like a piece of timber." The practical truth of the above singular and startling assertion was sustained by other positive testimony, respecting a road "over a very soft peat bog," by Wedmore and Glastonbury, in the county of Somerset. "The general strength of the road," (over the bog) "is from seven to nine inches, and five tons of stones was considered, for the repairs of this part of the road, equal to seven on the other part, over the hills." (Evidence before the Committee of the House of Commons, 11th March, 1819.) The preparation of the native soil and the manner of making the road, are easily described; but require judgment and nice attention on the part of the superintendent. The native soil must be drained, either by carrying the water to lower grounds, or, when that cannot be done, by raising the ground upon which the road is proposed to be laid, some inches above the level of the water. Having secured the soil from *under* water, the next step is to protect it from rain water.—This is thoroughly accomplished by a covering of stones, which, if properly prepared and placed, becomes smooth, solid, compact, and almost impenetrable. The prescribed size of the stones is six ounces in weight, or an inch longitudinally, and of angular shapes; round stones never will consolidate.—Six ounces, is the maximum; larger than this, the road will be rough, or become either rutted, or what is very significantly called in England, "gridironed," like the Troy and Albany road for example. To the excellence of the Troy and Albany road, however, I bear most willing testimony; at the same time I cannot help thinking, that if the method of Mr. McAdam had been adopted, it would have been in all respects better, though this opinion is hazarded with much diffidence in opposition to gentlemen whose judgment I am accustomed to treat with great deference. Mr. McAdam thinks weighing the best mode of measurement as applied to all qualities of stones. His surveyors carry small scales with a six-ounce weight, and if the largest stones selected from a heap do not exceed this weight, the rest will average less. He prefers placing the stones at three different times, the entire thickness not to exceed ten inches. Mr. McAdam says, in answer to a question before a select committee of the House of Commons, "I should think ten inches of solid material equal to carry any thing." Curb stones are not necessary, and the only operation after laying on the stones, is to keep the wheel track filled up until the mass is consolidated by means of the travel. The inclination towards the sides is one inch in three feet. This is found to be enough to carry off the water. On convex roads, carriages will seek the centre in order to keep upright, by which the road is unequally worn, and more severely tried than if the wheels roll on a flat surface with the tires in perfect contact.

It has been already stated, that the thickness of the covering is totally immaterial as to its own power of carrying weight. It should be thick enough to stand wear, but the main object is to exclude water; for, says Mr. McAdam, "experience has shown that if water pass through a road and fill the native soil, the road, *whatever may be its thickness,* loses its support and goes to pieces." In consequence of an alteration in a line of turnpike road near Bristol, "it was necessary to remove the old road"—a McAdam road—"and it was therefore left to wear very thin. On removing the road, "it was not more than three inches thick in most places, and in none more than four; no water had penetrated it, nor had frost affected it during the preceding winter, and the natural earth beneath the road, was found perfectly dry." Such is an imperfect abstract of Mr. McAdam's system, the object of which, in a few words, is to make a strong, solid, smooth covering to the native soil, previously dry; strong enough to prevent the carriages from wearing through; solid enough to be impervious to water; and so smooth, that the wheels meet with no obstructions, which would not only impede their progress, but have a tendency, by jarring and shaking, to loosen the materials of the covering. And all the objects have been accomplished by Mr. McAdam with so little expense, and such simplicity of construction, that "it is only wonderful (says Colonel Charles Brown, a witness before the committee of the House of Commons) we see it now, that it has not taken place sooner, being founded upon the best possible principle."

I have by me several publications of Mr. McAdam, together with the examinations of witnesses by Select Committees of the House of Commons, and the reports of those committees, in 1819 and 1823, contained in one volume, all tending to explain and establish the McAdam system. One of these reports says, "The general testimony borne to his complete success wherever he has been employed, and the proof that his improvements have been attended with an actual reduction of expense, induce your committee to attach a high degree of importance to that which he has already accomplished. The imitation of his plans is rendered easy by their simplicity, and by the candor with which he has explained them, though ability in the Surveyor to judge of their application must be understood as an essential requisite. (Rep. 25th June, 1819, and to the same effect, June, 1823.) Indeed, his success has been the result of a sound theory, confirmed by the test of time and experience. I wish we could manage to have much of the matter in my possession republished. It contains a vast deal of useful and practical information, of which I have given you a very meagre abstract—relating not only to road making and repairing, but also to the managements of the superintendence and of the finances of the public roads, in which latter particulars as well as in the first, our system is wofully defective.

I conclude with an apt quotation made by Mr. McAdam, by requesting that whoever favors him with a perusal, will not judge, by a few hours' reading, of the labours of nearly thirty years.

Very respectfully, your obedient servant,

C. H. HAMMOND.

*Hon. Geo. Tibbetts.*

*To The Editor of The Railroad Journal.*

Sir,

In the "New York American," of Tuesday last, I saw a communication signed "A Citizen," referring to an article published in the Railroad Journal, and copied into the American, upon the subject of McAdam Roads. The writer of that communication says, "it is not because we have not the skill, but because men are so generally appointed to be surveyors of roads, who do not understand the business." Now, sir, I am not disposed to undervalue the skill of the people of this country, in matters to which their attention has been drawn by a prospect of immediate pecuniary reward; although I may not be ready to admit *their* skill, or even that of "A Citizen" in McAdamizing roads, if the 3rd Avenue, to which he refers—however ready I may be to admit the truth of his remark, that it is a *magnificent road,*—is to be taken as a specimen of road-making upon the true McAdam system. If I recollect, sir, Mr. McAdam lays it down as a rule for all his surveyors to go by, that there must not be a stone in the road exceeding six ounces in weight; and so precise is he upon this point, that he requires them to carry a pair of scales and a six-ounce weight in their pocket, that they may not be deceived in this matter—not that they are required to weigh *every* stone, but merely to select a few of the *largest* from each heap, and if they exceed that weight they are to be broken over again. Now, sir, if I am not greatly mistaken, "A Citizen" will find by examining at least a *part* of the 3rd Avenue, that the first layer of stone not only exceeds six ounces, but even twice and thrice as many lbs.; and not only so, but they are laid in a *trench*, which is also directly contrary to his directions, as may be seen by the following extracts from his examination by a Committee of the House of Commons. The first refers to the repairing of old roads, which were made in the ordinary method, of laying large stone in a trench; the others refer to the construction of new roads.

"No addition of materials is to be brought upon a road, unless in any part of it be found that there is not a sufficient quantity of clean stone equal to ten inches in thickness.

The stone already in the road is to be loosened up and broken, so as no piece shall exceed six ounces in weight.

The road is then to be laid as flat as possible; a rise of three inches from the side to the centre is sufficient for a road thirty feet wide.

The stones when loosened in the road are to be gathered off by means of a strong heavy rake, with teeth two and a half inches in length, to the side of the road, and there broken, and on no account are stones to be broken *on* the road.

When the great stones have been removed, and none left in the road exceeding six ounces, the road is to be put in shape and a rake employed to smooth the surface, which will at the same time bring to the surface the remaining stone, and will allow the dirt to go down.

When the road is so prepared, the stone that has been broken by the side of the road is then to be carefully spread on it—this is rather a nice operation, and the future quality of the road will greatly depend on the manner in which it is performed.—The stone must not be laid on in shovelsful, but scattered over the surface, one shovelful following another and spreading over a considerable space."

"The practice common in England, and universal in Scotland, on the formation of a new road, is to dig a trench below the surface of the ground adjoining, and in this trench to deposit a quantity of large stones; after this, a second quantity of stone broken smaller, generally to about seven or eight pounds; these previous beds of stone are called the bottoming of the road, and are of various thickness, according to the caprice of the maker, and generally in proportion to the sum of money placed at his disposal. On some new roads, made in Scotland in the summer of 1812, the thickness exceeded three feet.

That which is properly called the road, is then placed on the bottoming, by putting large quantities of broken stone or gravel, generally a foot or eighteen inches thick, at once upon it.

Were the materials of which the road itself is composed, properly selected, prepared, and laid, some of the inconveniences of this system might be avoided; but in the careless way in which this service is generally performed, the road is as open as a sieve to receive water, which penetrating through the whole mass, is received and retained in the trench, whence the road is liable to give way in all changes of weather."

"As no artificial road can ever be made so good and so useful as the natural soil in a *dry state*, it is only necessary to procure and preserve this dry state of so much ground as is intended to be occupied by a road.

The first operation in making a road should be the reverse of digging a trench. The road should not be sunk below, but *rather raised above* the ordinary level of the adjacent ground; care should at any rate be taken, that there should be a sufficient fall to take off the water, so that it should always be some inches below the level of the ground upon which the road is intended to be placed: this must be done, either by making drains to lower ground, or if that be not practicable, from the nature of the country, then the soil upon which the road is proposed to be laid, must be raised by addition, so as to be some inches above the level of the water.

Having secured the soil from *under* water, the road-maker is then to secure it from *rain* water, by a solid road, made of clean, dry stone, or flint, or selected, prepared, and laid, as to be perfectly impervious to water: and this cannot be effected, unless the greatest care be taken, that no earth, clay, chalk, or other matter, that will hold or conduct water, be mixed with the broken stone; which must be so prepared and laid, as to unite by its own angles into a firm, compact, impenetrable body.

The thickness of such road is immaterial, as to its strength for carrying weight; this object is already obtained by providing a dry surface, over which the road is to be placed as a covering, or roof, to preserve it in that state: experience having shown, that if water passes through a road, and fill the native soil, the road, whatever may be its thickness, loses its support and goes to pieces."

"What depth of solid materials would you think it right to put upon a road, in order to repair it properly?—I should think that ten inches of well-consolidated materials is equal to carry any thing.

That is, provided the subtratum is sound?—No; I should not care whether the substratum was soft or hard; I should rather prefer a soft one to a hard one.

You don't mean you would prefer a bog?—If it was not such a bog as would not allow a man to walk over, I should prefer it."

Now permit me to ask, sir, if the Third Avenue, although I admit it to be a beautiful road, is constructed upon Mr. McAdam's plan? My object is not to depreciate, in the estimation of the people of this country, the merits of that work, or of the scientific gentleman who presides as Street Commissioner, over a very important department of the concerns of this vast city; but merely to show, that the merits of that work do not belong to Mr. McAdam, and also to shield him from reproach, should it not answer the high expectations of those who furnish the means of constructing this work,—and at an expense, I do not hesitate to say—judging from what I saw in passing—far beyond what would be necessary to make a road upon the true McAdam plan. This road is yet to be tested, after the fall rains shall have supplied its "reservoir" with water, by the frosts of our severe winters—I say *winters*, as a second or third may effect what the first may not,—before we can decide upon its being "equal to Mr. McAdam's roads;" and I would therefore suggest the propriety of the appointment of a competent person by the *city* or *state* of New York, to visit the roads in the Bristol District under the immediate superintendence of Mr. McAdam,—who, by-the-bye, was once a resident of this city, and is still recollected by some of our most respectable inhabitants—and other parts of Great Britain, for the purpose of collecting information upon the subject of road-making, to be published by authority, and distributed free of charge over all parts of the State. Such a course would have a great and beneficial influence upon the people, who are so deeply interested in having good roads; and it would give to New York another claim upon the gratitude of the community for its enterprize and public spirit.

ANOTHER CITIZEN.

*The following is the communication published in "The American," and referred to in the preceding:—*

I was pleased to see in your Saturday's paper the article from the *Railroad Journal* on the subject of good McAdam Roads.

The writer correctly remarks, that there is no branch of business so unskilfully performed in this country as road-making.

This is not because we have not the skill or talent in the country, but because men are so generally appointed to be surveyors of roads who do not understand the business—men who repair a road with the rich soil found at the surface, which a heavy shower will wash away, instead of looking round for hard gravel or other proper materials.

All our State legislatures pass laws about keeping roads in repair, but it is believed none of them ever adopted any measures to obtain or diffuse any information *how to make them.* The English House of Commons obtained all the information from their best road-makers, which was reported to the House by a committee; and the House ordered such information containing rules for making and repairing roads to be published for the public benefit—and perhaps no country has better roads than England.

One of the rules is, that the surface of the road should be nearly flat; a road of thirty feet wide *should rise only three inches from the side to the centre.*

Many of our roads have the centre eighteen inches higher than the sides, and are as rounding as the back of a turtle.

I passed last week on the Third Avenue which goes to Harlaem—on which many men are now at work—and I think it may truly be called a *magnificent road;* and it does honour to the city. The centre of the road is well McAdamized, wide enough for three carriages, and the sides are laid with good hard gravel; and I was glad to observe that the road-maker or engineer has adopted the rule of the English roads, by having very little rise from the sides to the centre, and has made the road nearly flat, so that a carriage can travel on all parts of it with equal ease. (I would suggest to the engineer that some of the stones were not broken up quite small enough.) I believe the same rule is adopted on the excellent new road from Albany to Troy, and also from Providence to Pawtucket.

Our streets are generally formed *less rounding* than formerly, which is a decided improvement.

Would it not be well for the Corporation to direct the engineer to report to them, on the rules and principles for road-making, and to let such report be published? If such rules are adopted by any one town or village surveyor of roads, it will so far be a public benefit.

A CITIZEN.

*Hoddesdon, Hertfordshire, England,*
*14th November,* 1832.

SIR,

IN the *Rail-road Journal,* (of New York) of 21st March last, volume first, No. 13, I saw a copy of a letter from you to the Hon. George Tibbets; by which, I am glad to see that the science of road-making has attracted notice in America; and I am flattered by your approbation of the system which I have ventured to recommend to my country.

As an acknowledgment of my obligation for your favourable opinion, I take the liberty of explaining to you the difficulty, I had almost said impossibility, of transmitting a proper and effectual knowledge of road-making by writing, so as to convey such a body of information as will enable a person to act upon it in every case and on every emergency that occurs; and unless the party directing be possessed of this knowledge, he will constantly be in danger of misdirecting in some, seemingly, trivial matter, that deranges the work, and defeats the object contemplated, however well his theory may be based on true principles: a practical man must also know, intimately, the value of every species of service to be performed by workmen, as compared with the value of labour in the country; it is in vain to expect economy in road-making, unless the whole work be done by the labourers by piece work.—Wherever day labour is the system, extravagant expenditure and boundless profusion will be the consequence. The sub-surveyor, whose duty it is to be constantly present where work is proceeding, ought to be able to fix the price of every piece of work, by weight or measurement, and to make such fair and equitable bargains with the workmen, as may enable them, by using a proper degree of industry, to earn the reasonable weekly wages of the country, the sub-surveyor ought also to be a very good judge of the quality of the work, so as to ensure to the public the proper value, as well as quantity, of labour for the money.

The sub-surveyor must have a perfect knowledge of what work is necessary to be done, and the manner and cost of its performance; he must be able to give to new and unpracticed workmen, such instructions, and to supply them with such tools, as may enable them, with due industry, to earn fair wages at reasonable prices.

He must also have a good practical experience in draining a road.—Difficult as it may be to explain the other branches of road-making by writing, this it is impossible to describe, or to teach, by any other process than experience under a skilful person; the shape of the country, the nature of the road, its situation with respect to the adjacent grounds, the nature of the soil, and many minor considerations, vary so often in every part of the same road and country, that the practice can be described and defined by no fixed rules or directions. If the sub-surveyor be not a practically-skilled drainer, the road he has the charge of, will neither be good, durable, nor preserved economically, unless his superior officer, the General-Surveyor, takes on himself the duty of directing the operations; which I and my family have been frequently obliged to do.

Our plan of distributing piece-work among the workmen, is to employ them in gangs, never exceeding five men; one of whom, selected by themselves, is called the gang-man; and with him the bargain is made by the sub-surveyor, for pieces of work sufficient to employ the gang about a week, as no great loss or damage can happen in that time and in that quantity.—If the gang do the work well, and earn fair wages by industry, they get another bargain; if idle, or disposed to slight the work, they are not again employed: by which means, a road is, in a short time, supplied with good and expert workmen.

When the improvement of roads commenced in England, in 1815, the cost of repairing the Bristol district of roads, (178 miles,) was about £19,000 annually; the roads being then in such a condition, that they were almost universally under notice of indictment; at present, the annual cost for repair, is about £13,000, including salaries for management.

I took the charge, as General-Surveyor, of the Bristol roads in 1815, and was obliged to instruct all the sub-surveyors, (nine in number;) they again instructed others; by which process we obtained, after some few years, some skilful surveyors. We have found, experimentally, that from one to two years are necessary for instructing a Sub-surveyor, according to his diligence and ability; and even when instructed, it is prudent to place him, for some time, near a more experienced surveyor, or more immediately under the inspection of the General-superintendant.

The system followed by my family and myself, is to take charge, as General-surveyors, of a number of districts of roads, or, as called in England, trusts. Upon those we keep one or more Sub-surveyors, according to the number of miles, and the work, in each trust.—We employ, at present, under my sons, grandsons, and myself, about a hundred Sub-surveyors; and we have in charge a considerable number of roads, both in England and Scotland. But our system is by no means universal: many sets of Trustees are attached to old surveyors; many, to old practices.—Economy and improvement have yet a great field to conquer in Britain;—in your more recent country, you have fewer obstacles to encounter.

The importance of skilful and respectable superintendence in the affairs of roads is *ill-understood in this country*; deep-rooted abuses, old prejudices, and some great defects in our system of road law, as to control, have all contributed to prevent the whole benefit we might have from good roads, at a moderate cost, notwithstanding the experience of eighteen years.

I am not acquainted with the laws and regulations under which the roads in the United States are managed; perhaps their care depends upon the Legislature of each individual State, perhaps upon a still smaller subdivision of authority, whereby it may be difficult to make an exertion for attainment of the practical science necessary for the general interest; but if such an exertion could be made on an efficient scale, I am persuaded it would be of infinite benefit, in producing immediately, at a reasonable expense, serviceable roads, which could be upheld at a cheap rate; it would also prevent the introduction of improper plans of road-work, which are frequently difficult to be eradicated.

Should it be found practicable to induce one or all of the States to attempt the introduction of a regular uniform system of road-work and road-management, on the most approved and economical plan, it would be necessary to send some persons to this country, to serve an apprenticeship of not less than a year.—Both classes of General-surveyors and Sub-surveyors require the necessary *practical* information; their duties are distinct, although pointing to one subject; their station in society ought also to be distinct.

The General surveyor should be a well-informed young gentleman, entering into life with a value for character, and having connections and a station that would place him beyond the reach of suspicion himself, and give him the consequence and authority so absolutely necessary for the due discharge of his duty in defending the interest of the public.—In addition to all the detail of the duties of a Sub-surveyor, in which he ought to be thoroughly informed, he must be an expert accountant, so as to be able to keep an effectual and steady control over the weekly accounts of the Sub-surveyors; and compare the work done with the money paid, with such skill as to preclude the possibility of extensive imposition proceeding for any length of time undiscovered. This service can only be performed effectually by a gentleman perfectly qualified; for the sub-surveyors, feeling themselves under the orders of an efficient General-surveyor, are attentive and careful in their conduct, but may soon throw off their circumspection when only under the authority of Trustees, who occasionally superficially and unskilfully look into their accounts, and are quite unequal to the necessary task of comparing the extent and quality of the work done with the money expended, or of giving a better direction to the work when they find it defective.

The Sub-surveyors should be selected from the class of yeomen, in England; in America, of decent farmers; their early acquaintance with agricultural labour has been found useful.—The duty of the Sub-surveyor is ministerial; he is to take the orders of Trustees through the General-surveyor, and to possess the skill and experience to have the work performed in a proper manner, and at a fair price; to be able to measure work correctly, and to settle with the labourers; his knowledge of figures should be such as to enable him to keep an intelligible account; to fill up, correctly, the forms of the weekly account which he will be furnished with, and to deliver it, in duplicate, every fortnight, to the General surveyor—one copy to be delivered to the Treasurer; the other to remain, as a record, with the General-surveyor, at all times open to inspection of Trustees and others interested.

Experience during eighteen years' practice has instructed us in many particulars that appear trivial, but which we find to be very important in making a road solid, impervious to water, smooth in the surface, so as to be easily travelled upon, and consequently kept in repair at a reasonable expense. Some theoretic opinions, at first adopted, have been corrected; others, given up as erroneous. The science of road-making is still capable of improvement for the benefit of mankind.

Your magnificent river, canal, and rail-road conveyances, will not supersede common roads; those great works promote industry, wealth, and population; communications must be multiplied to answer the increased demand of commerce; and to form communications with the great conveyances, America will require a number of stone roads in proportion to the extension of her great communications; and it will, in the end, be